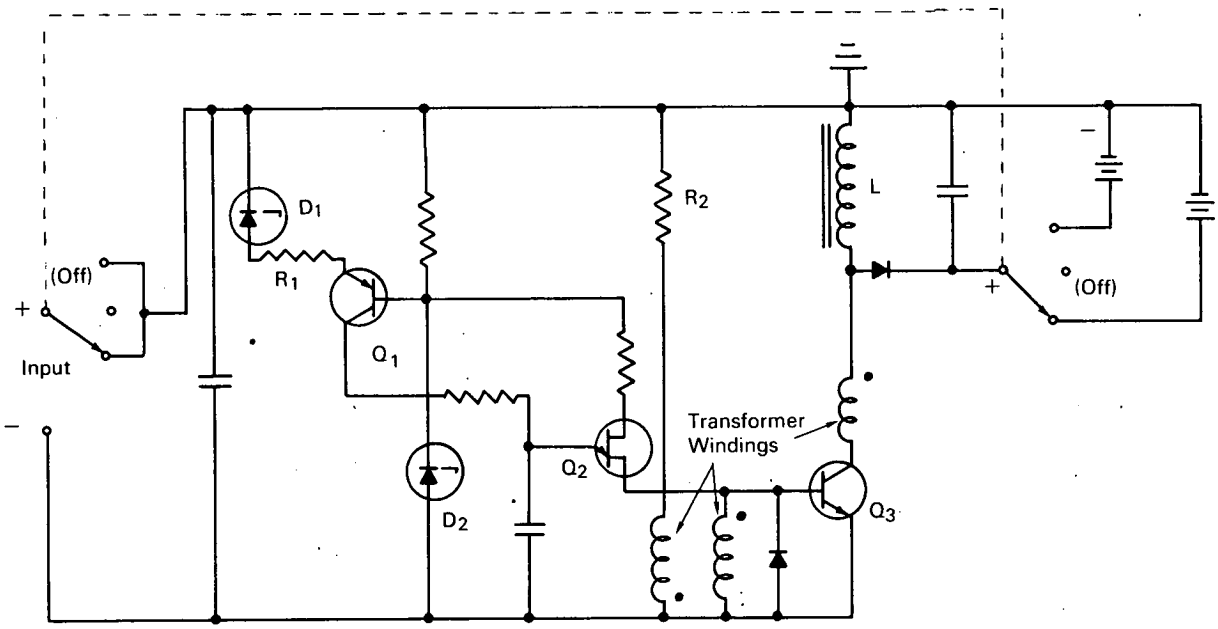
December 1967

Brief 67-10481

# NASA TECH BRIEF



## Converter Provides Constant Electrical Power at Various Output Voltages




### The problem:

To design a power converter that will transfer electrical energy at a constant rate from a solar cell source to a number of individual batteries, which are to be charged one at a time. For a particular application on a spacecraft, the power converter was required to invert the polarity of the solar cell source and also provide the correct charging voltage, which ranged from 3 to 25 volts.

### The solution:

A circuit that utilizes an inverted flyback technique as a means of transferring energy to the battery to be charged. Energy is stored in an inductor during a portion of the cycle and is released to the battery during the remainder of the cycle. The power (product of the input voltage and current) corresponding to the peak power point of the voltage vs current characteristic of the solar cell source is transferred to the battery, and does not change as a function of battery voltage.

### How it's done:

The saturable core transformer (consisting of three windings on one core) and transistor $Q_3$ comprise the flyback switching circuit. This transformer determines the energy storage period of the inductor L. $Q_2$ supplies the initial turn-on pulse to $Q_3$. At the end of the time required to energize the inductor (L) the transformer saturates. Under this condition, $Q_3$ is turned off and the stored energy in L is passed to the output circuit which has previously been switched to the desired battery. During this charging period, the

(continued overleaf)

transformer core is being reset through the transformer winding associated with resistor $R_2$.

The operating level of the input voltage is determined by the input sensing circuit comprised of $D_1$, $R_1$, $Q_1$, and $D_2$. These components are selected for operation at the peak power point on the voltage vs current curve of the solar cell source. Resistor $R_1$ limits the maximum current of $Q_1$. A potentiometer may be substituted for $R_1$ for setting the circuit to compensate for any variation in the peak power point of the solar cell source.

**Note:**

Inquiries concerning this innovation may be directed to:

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Reference: B67-10481

**Patent status:**

No patent action is contemplated by NASA.

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